LAND PRODUCT

SUBGROUP REPORT

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Sioux Fall, South Dakota USA, June 15-17 2004

LPV outline

- review of subgroup's status and goals
- LPV activities
  - NASA funding for LPV activities
  - Updated web site
  - CEOS/WMO Product Accuracy statements updates
  - CEOS Core Sites (with WGISS)
  - Special Issue – in progress
  - TOPC Implementation plan
  - Upcoming workshops
  - Report from recent workshops
- WGCV and CEOS recommendations

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CEOS Definition

Validation:

the process of assessing by independent means the quality of the data products derived from the system outputs

(LPV will operates under this definition, but also with the understanding that validation activities should consider user accuracy needs and feedback to algorithm improvements.)

Mission Statement & Goals

- to foster quantitative validation of higher level global land products derived from remote sensing data and relay results so they are relevant to users
- to increase the quality and economy of global satellite product validation *via* developing and promoting international standards and protocols for field sampling, scaling, error budgeting, data exchange for global land product validation
- to advocate mission-long validation and intercomparison programs for current and future earth observing satellites.

Objectives

- Work with users to define uncertainty objectives
- Identify opportunities for coordination and collaboration
  - Through product Inter-comparisons
  - Through global test sites for systematic measurements
- Develop consensus “best practice” protocols for data collection and description
  - Workshops
  - Case studies
  - Publications *(with CEOS WGCV “endorsement”?)*
- To develop procedures for validation, data exchange and management - with a focus on land product validation core sites (done in conjunction with WGISS)
- To serve as a clearinghouse for accuracy statements on CEOS member global land products (through the CEOS/WMO database)

Big Picture

LPV provides a validation service to the Integrated Global Observation Strategy's:

Global Terrestrial Observation System and

Global Carbon Observing System

Implications:

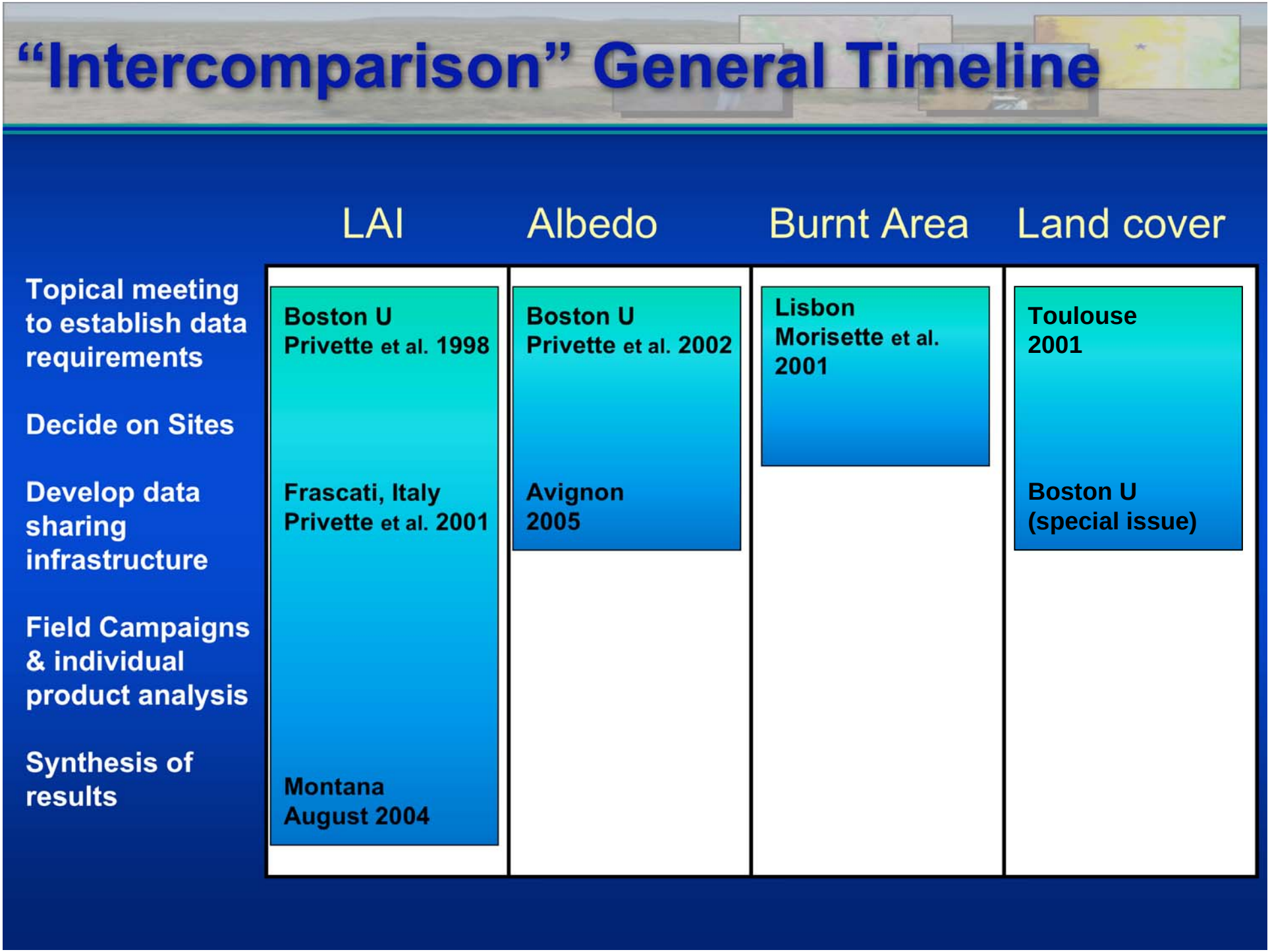
- Focus Products: Biophysical, Land Cover, Fire Disturbance, & Albedo
- Working in conjunction with GOFC/GOLD's regional networks
- Need to integrate with TEMS, GT-Net, & UN's GLC-net

Strategy for developing protocols

LPV is working toward protocols with three steps:

- Workshops (kick off, strategy/work plan, results)
  - Bringing together producers, users, and validation experts to initiate discussion, establish the “state of the art”, and consider core sites or regions for validation activities
- Case studies (currently) - Inter-comparisons (moving toward)
  - Posted on the LPV web site
  - First step in developing a more formal protocol
- Publication(s) (proposed special issue)
  - Peer review document with details pertaining to the validation of a given global land product.

"Intercomparison" General Timeline



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NASA funding for LPV activities

"Maintaining and Refining NASA's Land Product Validation Infrastructure"

Funding for:

- LPV workshops
- web infrastructure
- post-doc research position and
- data for "Core Sites"

Three years of support: 2004-2006

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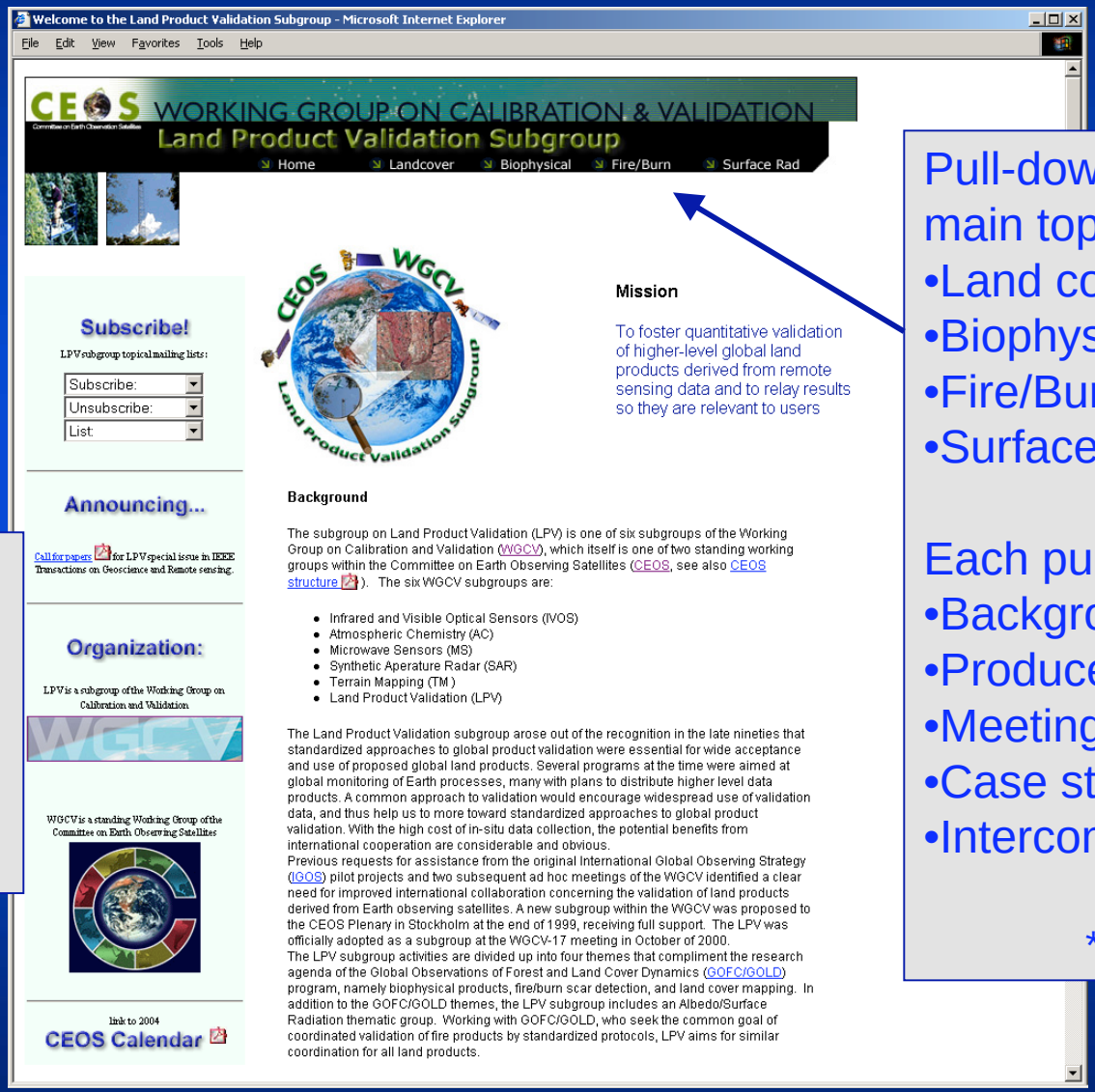
http:landval.gsfc.nasa.gov/LPVS

Matches WGCV page layout and graphic



Pull-down menu for main topical areas:
- Land cover
- Biophysical
- Fire/Burn
- Surface Radiation

Each pull-down lists:
- Background
- Producers *
- Meetings
- Case studies
- Intercomparisons

* input needed

Quick links to:
- Listserves
- Announments
- WGCV
- CEOS and
- CEOS calendar

web curator: Jaime Nickeson

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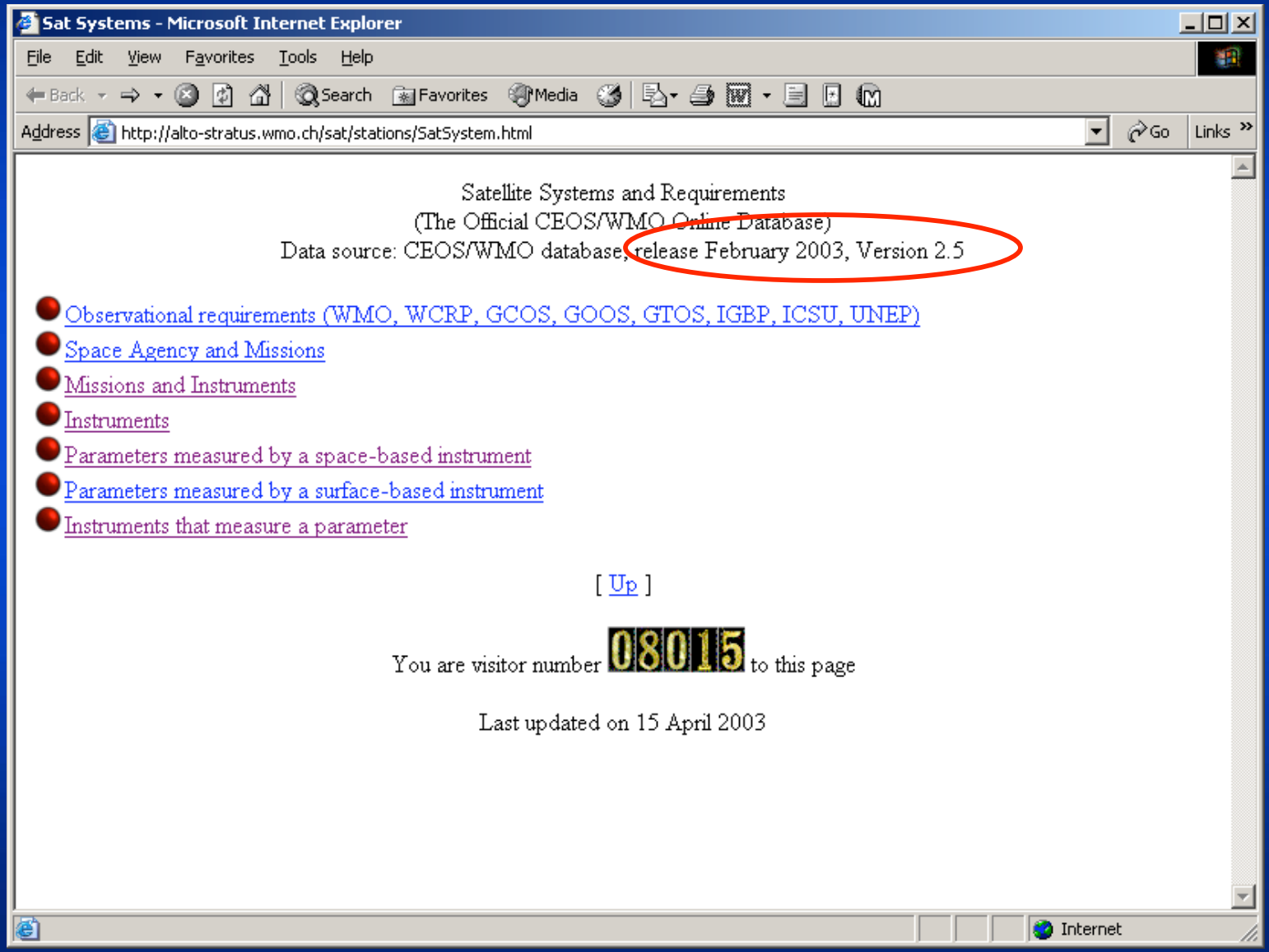
CEOS/WMO page



…example from MODIS parameters

Parameter	Resolution	Accuracy	Obs Cycle	Delay
Fire area	1 km	5 % (Max)	1 d	Missing
Fire temperature	1 km	Missing	1 d	Missing
FPAR	1 km	25 % (Max)	10 d	Missing
Land cover	1 m	Missing	0.085 y	Missing
Land surface imagery	Missing	Missing	Missing	Missing
Land surface temperature	1 km	1 K	24 h	24 h
Leaf Area Index (LAI)	1 km	25 % (Max)	10 d	2 d
NDVI	1 km	10 % (Max)	10 d	24 d
Sea-ice cover	1 km	Missing	24 d	24 d
Snow cover	1 km	10 % (Max)	168 h	576 h
Vegetation type	1 km	Missing	96 d	2 d

CEOS/WMO database

- Contacts: Don Hinsman & Stephen Ward at WMO
- Will be updated “shortly”
- Procedure is to contact rep at space agency
- There is an opportunity to link to relevant WGCV subgroup pages to provide further details and supporting material.

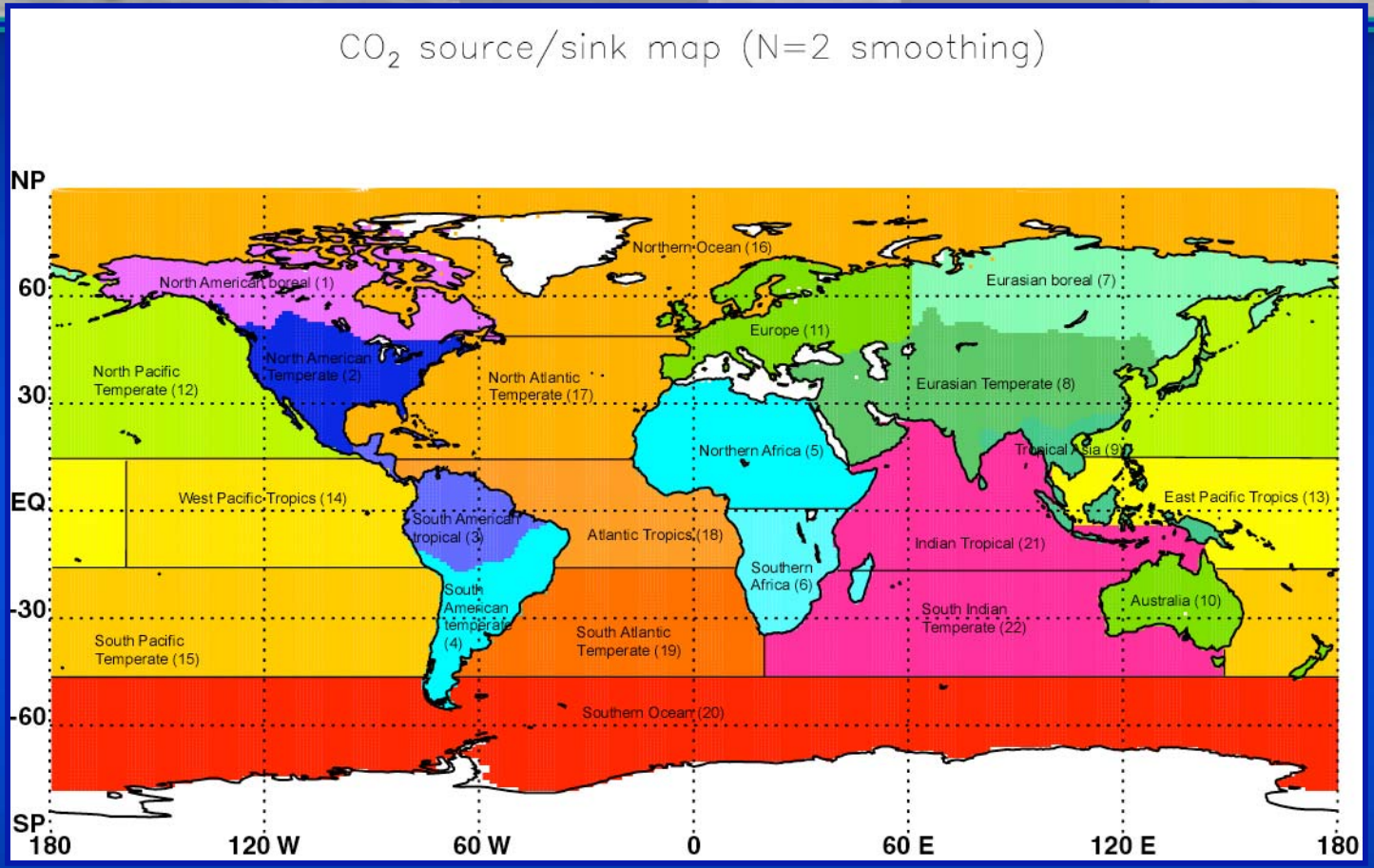
Accuracy statements

- Should be “user-oriented” and supported with peer-review literature
- Standardize/summarize information for each product
- MODIS land team plans to update CEOS information for MODIS land products (working with Stuart Frye)

MODIS validation “hierarchy”

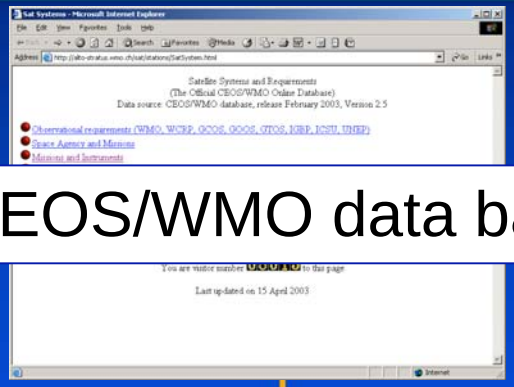
- **Stage 1 Validation:** Product accuracy has been estimated using a small number of independent measurements obtained from selected locations and time periods and ground-truth/field program effort.
- **Stage 2 Validation:** Product accuracy has been assessed over a widely distributed set of locations and time periods via several ground-truth and validation efforts.
- **Stage 3 Validation:** Product accuracy has been assessed and the uncertainties in the product well established via independent measurements in a systematic and statistically robust way representing global conditions.

Biome Map

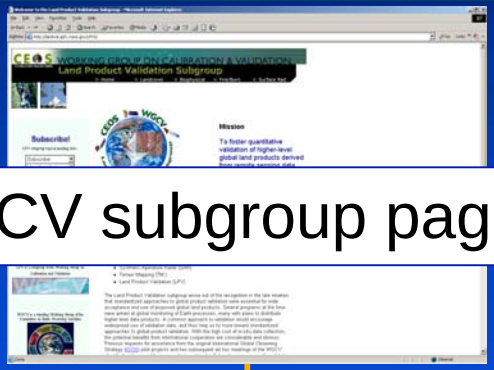


- Exhaustive and mutually exclusive global biome map
- Closely matches several GOFC/GOLD regional networks
- Published - independently of LPV `Gurney et al. (2002)`

CEOS/WMO database, potential framework



CEOS/WMO data base



WGCV subgroup page

Link to accuracy statement for each product

- Overall accuracy statement
- Link to specific LDOPE page
- List of support material

… supporting materials

- Title, author, abstract
- Figures/captions
- Tables/captions

Producer maintained validation page

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CEOS Core Sites

"CEOS Core Sites": WGISS Test Facility
Joint project between CEOS Working Group on Cal/Val and Working Group on Information Systems and Services

Need to consider integration with:

- **SPECTRA Earth Explorer site inventory**
- **Test Site Dossier**
- **TEMS & GT-Net**
- **UN Global Land Cover Network**

More on this tomorrow…

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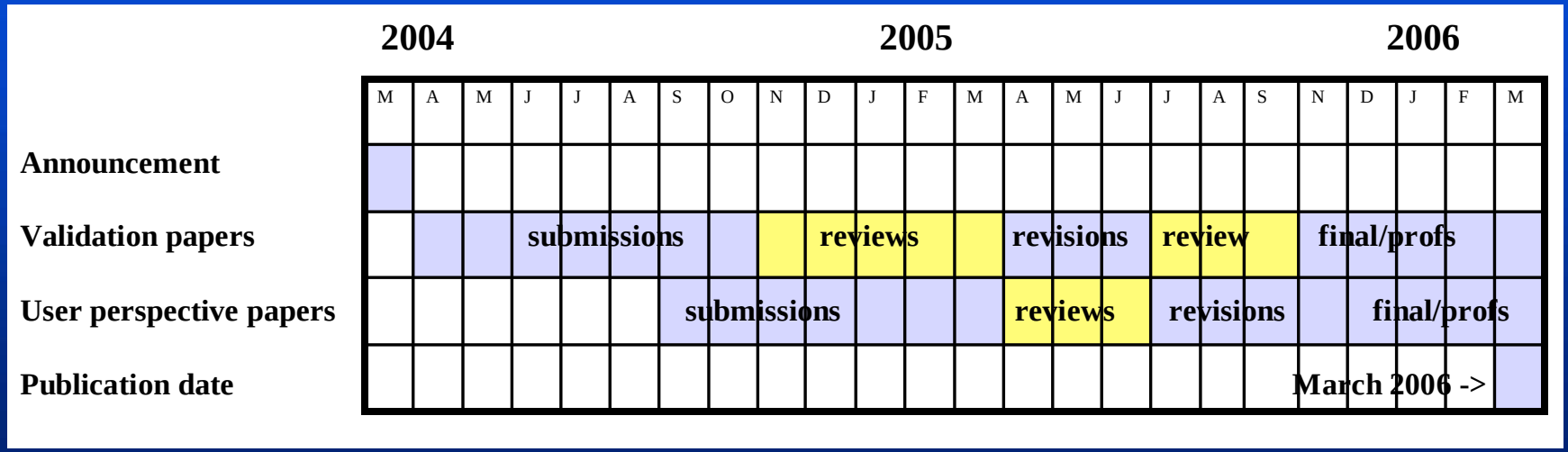
LPV "Special Issue"

- Special Issue: describing the state of the art research on both protocol and results for validation and accuracy assessment of global land products (Liang, Baret and Morisette, eds.)
- Three sections:
  - Surface Radiation variables
  - Ecosystem variables
  - Land cover characteristics (including land cover change, fire, and burnt area)
- Solicit a summary from User/GCM community to write a note for each section on the implication for the uncertainty/validation of the products



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TOPC Implementation Plan

Requested by “Conference of the Parties – 9”

Draft of Section F: Terrestrial Domain forward to LPV through Alan Belward

WGCV mentioned 19 times, LPV explicitly mentioned once

Special issue should provide “state-of-the-science” for several parameters listed in section F, Table 12:

- Snow cover (Glaciers)
- Albedo
- Land use (historical)
- Land cover
- LAI/FAPAR
- Land Surf. Temp.
- Biomass
- Fire disturbance

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LPV Upcoming Topical workshops

- **Results workshop for LAI-intercomparison**
  16 August 2004, University of Montana, Missoula, USA
- **Ground-based Accuracy Assessments for Fire Occurrence and Deforestation Events**
  26 July 2004, Brasilia (as part of LBA)
- **Albedo/BRDF Intercomparison (perhaps with IVOS)**
  2005 Avignon, France
- **Continuous Fields validation**
  (TBD: possibly UMd)

Participation in:

"Integrated assessment of the land system: The future of land use"
28-30 October 2004, Institute for Environmental Studies
Amsterdam, the Netherlands

"GOFC-GOLD/FAO Workshop on Harmonization of Global Land Cover Products"
15-16 July 2004, FAO in Rome

"Ameriflux" meeting
5-7 October, Boulder Colorado

"Baseline Surface Radiation Network" meeting,
26-30 July 2004, Exeter, U.K

85th AMS Annual Meeting
9-13 January 2005, San Diego, CA USA

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LPV Topical workshops

- Follow-up Land Cover/Change
  aiming toward "best practices" document
  2-4 February 2004, Boston University, USA
- Fire and Burn scar:
  Global Geostationary Fire Monitoring Applications
  A Joint GOFC/GOLD Fire and CEOS LVP Workshop
  March 23-25, 2004, EUMETSAT, Darmstadt, Germany
  (related to Action WGCV 20-8)

Presentation at the
2nd SPOT VEGETATION User's Conference
24-26 March, Antwerp Belgium
"**Initial Validation of NDVI time series from AVHRR, SPOT VEGETATION and MODIS**"

SPOT VEGETATION User's Conference

- Results were put in the context of CEOS and CEOS "Core Sites"
- Closing panel discussion emphasized the importance of validation
- Long-term NDVI time series tells us something about climate change
- Long-term NDVI requires integrating data from multiple sources, which requires inter-comparison/validation

Topical workshop: fire

Global Geostationary Fire Monitoring Applications
A Joint GOFC/GOLD Fire and CEOS LVP Workshop
March 23-25, 2004, EUMETSAT, Darmstadt, Germany
(related to Action WGCV 20-8)

34 attendees from 12 countries

The GOFC/GOLD program recommends space agencies work toward an integrated, global high temporal resolution fire monitoring system from geostationary platforms.

This objective will be achieved if products from different geostationary platforms can be combined in a relatively seamless fashion. Quantifying the accuracy of the products from each sensor will help ensure proper use when these products are combined.

Topical workshop: Land cover

- Reconnaissance…
  …confidence building…
  …statistical approaches
  - Model based
  - designed based
- Build on lessons from IGBP
- Coordinated GLC2000 and MODIS LC
- Utilize WGCV “core site” for high resolution data
- Utilize GOFC/GOLD for regional expertise

Morisette, Privette, Strahler, Mayaux, Justice, in press.

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Recommendations to WGCV: CEOS/WMO

Whereas:

- **WGCV can capitalize on the continued existence and maintenance of the CEOS/WMO database.**
- **Subgroups are uniquely qualified to provide specific information and additional details for relevant products to the CEOS/WMO database**

LPV recommends:

- **To initiate improved coordination between WGCV and the CEOS/WMO data base, LPV act as a pilot project for integrating information on global land product validation with the CEOS/WMO database.**

Recommendations to WGCV: Land cover

Currently the primary user of global land product validation are the product producers who use the results to improve the product in an iterative procedure. Hence further outreach to the user community is needed.

More work is needed to connect accuracy assessment to specific user requirements – focusing on such users as climate modelers, UNEP, and FAO. LPV will consider a workshop to solicit input from these user communities.

LPV will (perhaps jointly) sponsor a workshop on the validation of continuous field validation
(UMd, Fall 2004)

GLC2000 and MODIS land cover should be integrated into the CEOS Land Validation Core Sites and the core sites should be coordinated with the GOFC/GOLD land cover reference data "clearinghouse". Using this infrastructure an inter-comparison of year 2000 MODIS data and GLC2000 should go forward.

Recommendations to CEOS: Fire

Whereas:

- **Together with GOFC/GOLD, LPV supports the technical feasibility and research utility of an integrated, global high temporal resolution fire monitoring system from geostationary platforms.**
- **Such a system will be achieved if products from different geostationary platforms can be combined in a relatively seamless fashion.**
- **Coordination on validation activities would results in cost sharing and ensure consistency of methods**

LPV recommends:

- **The validation of system components should be coordinated through the Land Product Validation (LPV) subgroup**

Recommendations to CEOS: Land cover

Whereas:

- **Global land cover maps at coarse resolution pose significant problems for accuracy assessment, including the high frequency of missed pixels, difficulty in precise geolocation of map products and reference materials and logistical difficulties associated with field data collection**
- **Validation of land cover is critical - without proper validation land cover maps can be misleading**
- **Proper validation is a substantial task**

LPV recommends:

- **CEOS members producing land cover maps integrate and utilize the complimentary efforts of:**
  1) **the GOFC/GOLD Land Cover Implementation Team's effort to coordinate Land cover reference data and**
  2) **the CEOS Land Validation Core Sites**
- **Proper statistical sampling is preferred, however practical limitation imply the the need for further research on the Statistical implications of using non-randomly selected sites to derive accuracy figures**
- **global land cover producers consider means to relate their land cover products to the "Land Cover Classification System"**

references

Gurney et al. (2002) Towards robust regional estimates of CO2 sources and sinks using atmospheric transport models. Nature, 415, 626-630, 7 Feb. 2002.

Morisette, J. , C. Justice, J. Pereira, J.M. Grégoire, and P. Frost, 2001, "Report from the GOFC – Fire: Satellite Product Validation Workshop", *Earth Observer,* September/October, v. 13, n. 5, p. 15-18..(available on-line at *http://eospso.gsfc.nasa.gov/eos_observ/9_10_01/Sept_Oct01.pdf*

Morisette, Privette, Strahler, Mayaux, Justice, "Validation of Global Land-Cover Products by the committee on Earth Observing Satellites", Geospatial Data Accuracy Assessment, Lunetta and Lyon eds., in press.

Privette, J., R. Myneni, J. Morisette and C. Justice, 1998. Global validation of EOS LAI and FPAR products, *EOS Earth Observer*, 10(6) 39-42.

Privette, J.L, J.T. Morisette, F. Baret, S.T. Gower and R.B. Myneni,, 2001. Summary of the international workshop on LAI product validation, *EOS Earth Observer*, 13(3) 18-22.

Privette, J.L., C.B. Schaaf, A. Strahler, R. Pinker, M. Barnsley, and J. Morisette, 2002. Summary of the international workshop on albedo product validation. *EOS Earth Observer*, 14 (6) p.17-18.